UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

WATER-RESOURCES STUDIES IN UTAH

JULY 1, 1981, TO JUNE 30, 1982

Compiled by Linda S. Hamblin

U.S. GEOLOGICAL SURVEY

OPEN-FILE REPORT 82-643

Salt Lake City, Utah
July 1982

CONTENTS

CONTENTS—Continued

WATER-RESOURCES STUDIES IN UTAH

JULY 1, 1981, TO JUNE 30, 1982

Compiled by Linda S. Hamblin

INTRODUCTION

This report summarizes the progress on water-resources studies in Utah by the U.S. Geological Survey during the period July 1, 1981, to June 30, 1982. Much of the work was done in cooperation with the State of Utah or local agencies. Additional supporting funds were transferred from other Federal agencies or appropriated directly to the Geological Survey.

The State and local cooperators were:

Utah Department of Natural Resources
- Division of Water Rights
- Division of Water Resources
- Division of Wildlife Resources
- Geological and Mineral Survey

Bear River Commission
Utah Department of Transportation
Salt Lake County
Salt Lake County Division of Flood Control and Water Quality
Central Utah Water Conservancy District
Lower Gunlock Reservoir Corp.

The Federal cooperators were:

Bureau of Land Management
Bureau of Reclamation
Environmental Protection Agency
Federal Energy Regulatory Commission
Corps of Engineers

The program in Utah at the end of the reporting period consisted of 24 projects, and a discussion of each project is given in the following pages. Short descriptions are given at the end of the report for five proposed projects to be started on or after July 1, 1982.

In addition to the 29 projects mentioned above, work is being completed on reports for 6 other projects. The status of the reports is as follows:

UT 117 "Reconnaissance of geothermal resources of Utah." In press as U.S. Geological Survey Professional Paper 1044-H.

UT 135 "Hydrology of coal-resource areas in the southern Wasatch Plateau, central Utah." In review.

UT 136 "Bedrock aquifers in the northern San Rafael Swell area, Utah, with special emphasis on the Navajo Sandstone." In review.

UT 137 "Ground-water reconnaissance of the central Weber River area, Morgan and Summit Counties, Utah." In review.

UT 138 "Hydrology of the Price River Basin, Utah, with emphasis on selected coal-field areas." In review.

"Selected hydrologic data, Price River Basin, Utah, Water Years 1979 and 1980." In review.

UT 149 "Ground water in Utah's rapidly growing Wasatch Front area-The challenge and the choices." In review.

THE FOLLOWING REPORTS WERE RELEASED TO THE OPEN FILE:

Aquifer systems in the Great Basin Region of Nevada, Utah, and adjacent states--A Study Plan: U.S. Geological Survey Open-File Report 82-445.

Erosion and sediment characteristics of the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Open-File Report 82-428.

Reconnaissance of the quality of surface water in the San Rafael River Basin, Utah: U.S. Geological Survey Open-File Report 80-574.

Reconnaissance of the quality of surface water in the Weber River basin, Utah: U.S. Geological Survey Open-File Report 82-175.

Results of an aquifer test near Lynndyl, Utah: U.S. Geological Open-File Report 82-514.

Surface-water and climatological data, Salt Lake County, Utah, water year 1980: U.S. Geological Survey Open-File Report 81-1111 (duplicated as Utah Hydrologic-Data Report 36).

Water-resources studies in Utah, July 1, 1980, to June 30, 1981: U.S. Geological Survey Open-File Report 81-903.

THE FOLLOWING REPORTS WERE PUBLISHED:

Bedrock aquifers in the lower Dirty Devil River Basin, Utah, with special emphasis on the Navajo Sandstone: Utah Department of Natural Resources Technical Publication 68.

Contours of the base of the Quaternary deposits in the Jordan Valley, Utah: in Ground-water quality management (background report): Salt Lake County Division of Water Quality and Water Pollution Control duplicated report.

Ground-water conditions in Utah, spring of 1981: Utah Division of Water Resources Cooperative Investigations Report 21.

Hydrologic reconnaissance of the Wasatch Plateau-Book Cliffs coal-fields area: U.S. Geological Survey Water-Supply Paper 2068.

Map showing general chemical quality of ground water in the Richfield Quadrangle, Utah: U.S. Geological Survey Miscellaneous Investigations Map I-1374.

Seepage study of the Sevier River and the Central Utah, McIntyre, and Leamington Canals, Juab and Millard Counties, Utah: Utah Department of Natural Resources Technical Publication 74.

Selected climatic characteristics of the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-91.

Test drilling for fresh water in Tooele Valley, Utah: Utah Division of Water Rights Information Bulletin 26.

Utah water-use data, public-water supplies, 1960-78: Utah Department of Natural Resources, Utah Water Use Report 1.

Utah water-use data, public-water supplies, 1979, Utah Department of Natural Resources, Utah Water-Use Report 2.

Water resources data for Utah, water year 1979: U.S. Geological Survey Water-Data Report UT-80-1.

COLLECTION OF BASIC RECORDS - SURFACE WATER

Number: UT 00-001-FOICL

Cooperating Agencies: U.S. Bureau of Reclamation; U.S. Corps of Engineers; U.S. Bureau of Land Management; Federal Energy Regulatory Commission; Utah Division of Water Rights; Utah Division of Water Resources; Bear River Commission; Salt Lake County; Central Utah Water Conservancy District; Lower Gunlock Reservoir Corp.

Staff: R. W. Cruff, Hydrologist, Project Chief (part time)
Other District personnel as assigned

Period of Project: Continuing

Objective: To obtain data on stream discharge or stage and reservoir or lake stage at selected sites throughout Utah.

Approach: Standard methods for the operation and maintenance of gaging stations and for the computation of streamflow records were used.

Progress: Field and office work necessary for the publication of records for 209 streamflow stations, 17 reservoirs, and 3 lake-stage stations continued during the year. The stations are classified as follows:

Current purpose or project related	135
Hydrologic	58
Benchmark or long-term change	12
Regulated	4
Reservoirs (long-term management)	17
Lake stage	3

Gaging stations discontinued were:

West Fork Duchesne River below Dry Hollow, near Hanna
Rock Creek below Miners Gulch, near Hanna
Strawberry River above Red Creek, near Fruitland
Red Creek below Currant Creek, near Fruitland
Yellowstone River near Mountain Home
Lake Fork River near Altonah
Lake Fork River near Altamont
Lake Fork River near Upalco
Lake Fork River near Myton
West Channel Uinta River below diversion works, near Whiterocks

East Channel Uinta River below diversion works, near Whiterocks
East Channel Uinta River at County road bridge, near Whiterocks
East Channel Uinta River at LaPoint Road, near LaPoint
Farm Creek near Whiterocks
Whiterocks River below dam site, near Whiterocks
Whiterocks River below Farm Creek Canal, near Whiterocks
Whiterocks River at Whiterocks
Uinta River at Fort Duchesne
Dry Gulch near Fort Duchesne
Uinta River at Randlett
Bear River near Collinston
Evacuation Creek near Watson
Sand Wash near Ouray
Sand Wash near mouth, near Ouray
North Wash near Ouray
Cottonwood Wash at mouth, near Ouray
Hill Creek above Towave Reservoir, near Ouray
Hill Creek near mouth, near Ouray

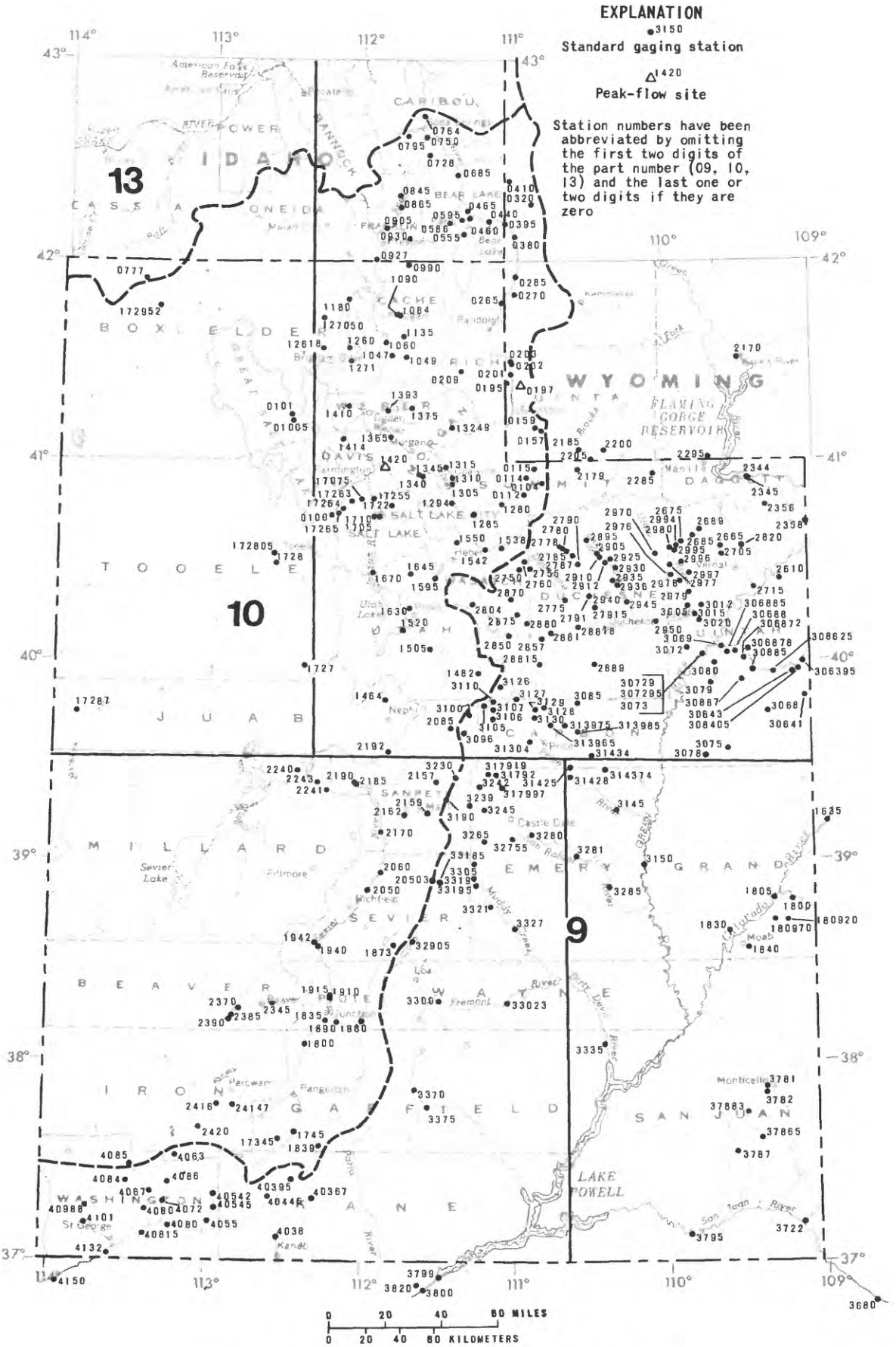
Plans for Next Year: Continue operation of network. Prepare 1982 water-year records for publication.

Reports:

Water resources data for Utah, water year 1980, U.S. Geological Survey Water-Data Report UT-80-1.

Water resources data for Utah, water year 1981: U.S. Geological Survey Water-Data Report UT 81-1 (in press).

"Streamflow and reservoir contents in Upper Colorado River Basin" is issued monthly.



Location of gaging stations in Utah, September 1981.

COLLECTION OF BASIC RECORDS-GROUND WATER

Number: UT 00-002-FC

Cooperating Agencies: Utah Division of Water Rights;
Utah Division of Wildlife Resources;
Utah Department of Transportation

Staff: L. R. Herbert, Hydrologic Technician, Project Chief (part time)
M. E. Smith, Hydrologic Technician (part time)
C. B. Burden, Hydrologic Technician (part time)
Other District personnel as assigned

Period of Project: Continuing

Objective: To obtain long-term data on ground-water levels throughout the State and determine water-level trends in selected areas.

Approach: Standard methods for the observation, recording, and reporting of water levels were used.

Progress: Water-level measurements were made semiannually in about 700 wells, and continuous water-level data were obtained by recorders at 37 wells as part of the Statewide observation-well network. Continuous records of discharge were obtained at one spring. Water levels in approximately 1,000 wells were measured during February-March for the preparation of annual water-level-change maps.

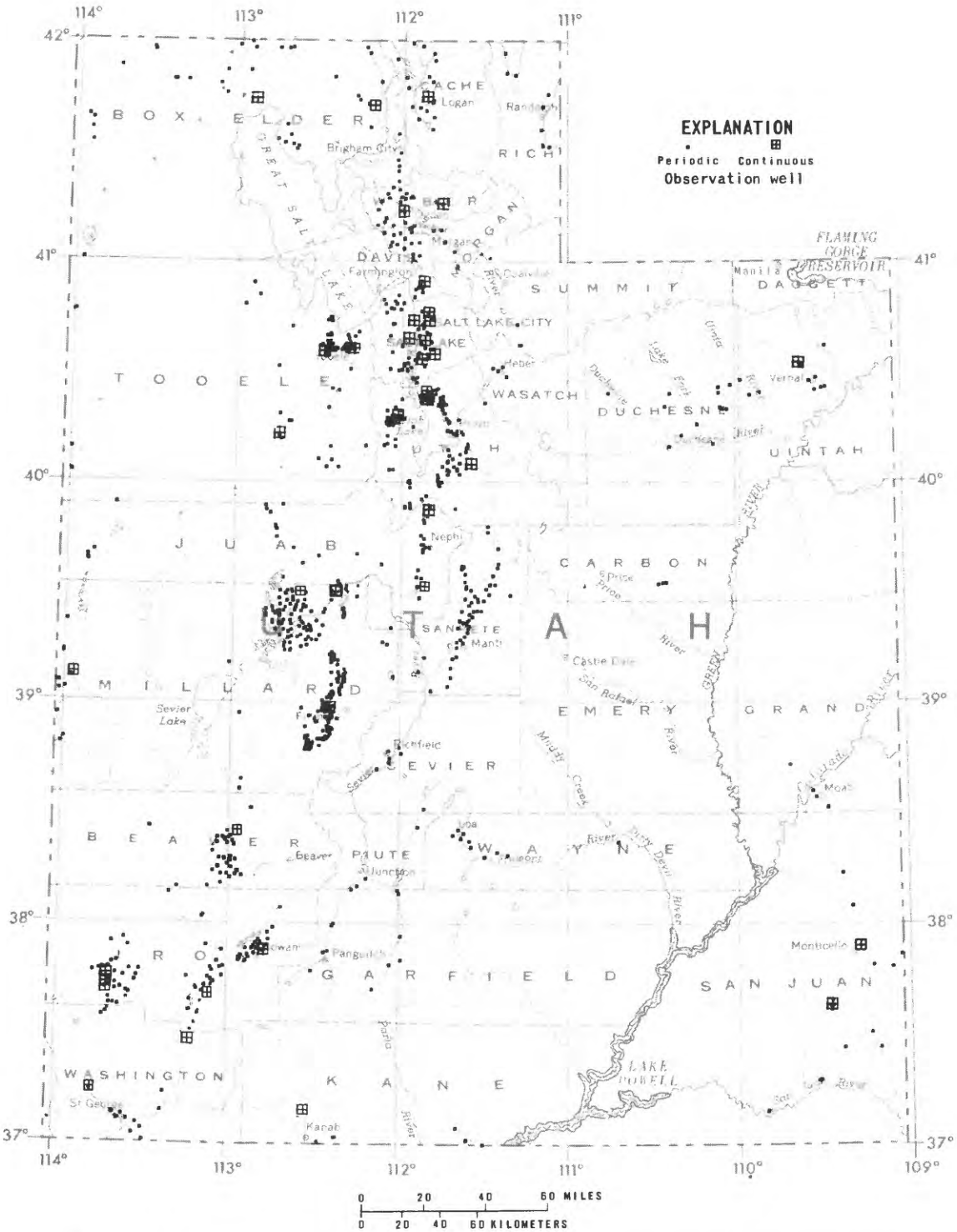
Plans for Next Year: Continue operation of the network of observation wells and measurement of spring discharge. Prepare records for publication.

Reports:

Water resources data for Utah, water year 1980, U.S. Geological Survey, Water-Data Report UT-80-1.

Water resources data for Utah, water year 1981: U.S. Geological Survey Water-Data Report UT-81-1 (in press).

Water-level-change maps, February or March 1982 (for 15 areas in Utah). (Issued April 1 as local press releases and distributed to interested individuals.)



Location of observation wells in Utah where ground-water levels were measured.

COLLECTION OF BASIC RECORDS - QUALITY OF WATER

COLLECTION OF BASIC RECORDS - SEDIMENT

Number: UT 00-003-FOIC;
UT 00-004-FOIC

Cooperating Agencies: Utah Division of Water Rights;
Utah Division of Water Resources;
Utah Division of Wildlife Resources;
Utah Geological and Mineral Survey;
U.S. Bureau of Land Management;
U.S. Environmental Protection Agency;
U.S. Bureau of Reclamation

Staff: R. W. Cruff, Hydrologist, Project Chief (part time)
Other District personnel as assigned

Period of Project: Continuing

Objective: To obtain long-term records of the quality of water at selected stream sites, springs, and wells in Utah and to obtain shorter-term records for use by other Federal or State agencies involved in development of water resources or environmental protection.

Approach: Standard methods for the collection and analysis of chemical-quality and fluvial-sediment samples were used.

Progress: Data on the quality of surface water were collected at 33 sites in Utah. Daily chemical-quality records were collected at 10 stream sites and periodic chemical-quality records at 23 stream sites. Data on the specific conductance of surface water were obtained at an additional 181 stream-gaging stations in Utah. Daily sediment records were collected at 6 sites and periodic sediment records at 21 sites. Daily water-temperature data were obtained at 10 sites and monthly temperature data at 181 sites. Data on the quality of ground water were collected at about 375 wells in Utah.

All water-quality records for inclusion in "Water Resources Data for Utah, 1981" were completed and photocopy was prepared.

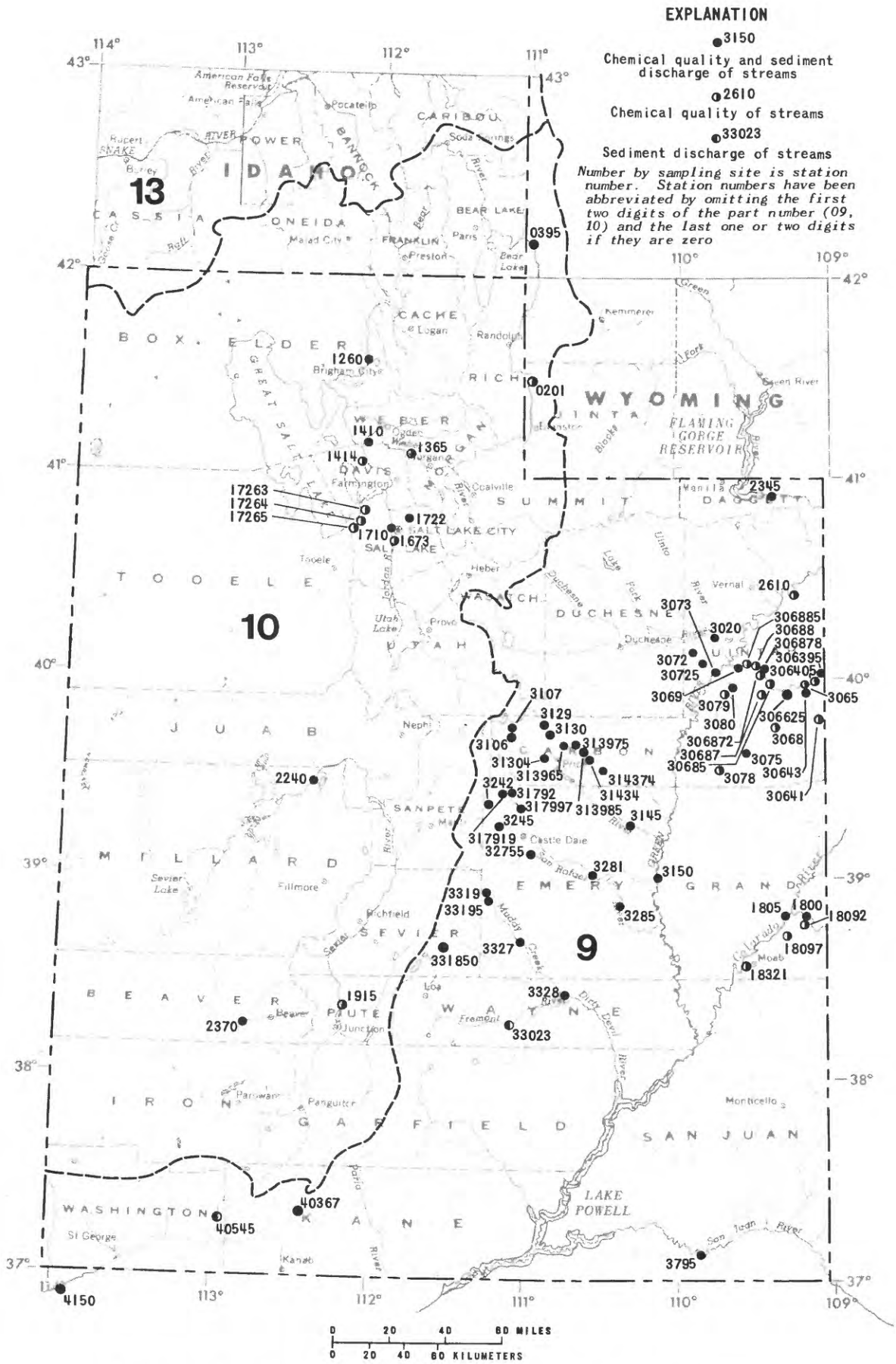
Plans for Next Year: Continue field-data collection and records processing and preparation of records for publication.

Reports:

Water resources data for Utah, water year 1980: U.S. Geological Survey Water-Data Report UT-80-1

Water resources data for Utah, water year 1980: U.S. Geological Survey Water-Data Report UT-81-1 (in press).

Thompson, Kendall R. (in review), Characteristics of suspended sediment in the San Juan River near Bluff, Utah, with a section on general source areas of runoff and sediment discharge by J. C. Mundorff: U.S. Geological Survey Open-File Report.



Location of surface-water quality stations in Utah, September 1981

STATEWIDE WATER USE

Number: UT 78-007-C

Cooperating Agency: Utah Division of Water Rights

Staff: R. W. Cruff, Hydrologist, Project Chief (part time)
D. Hooper, Engineer, Utah Division of Water Rights
R. Schwarting, Utah Division of Water Rights
Other State personnel as assigned

Period of Project: Began July 1977, continuing

Objective: To obtain Statewide information about withdrawals and return flows of water for various uses and consumptive use of water in connection with each type of withdrawal.

Approach: Field inventory of surface-water diversions and some types of ground-water diversions, acreage and crop surveys, refinement and application of all data necessary to determine consumptive use.

Progress: Mail surveys were made of public suppliers and of major self-supplied and public-supplied industries. Approximately 100 public suppliers and industries were visited to verify the data during the year. The 1979 water-use data report was published and distributed during the year.

Plans for Next Year: Data for public supplies and industrial uses will continue to be collected and verified. The water-use report for 1980 and 1981 will be prepared. Data will be submitted to the National computer water-use data base in Reston.

Reports:

Hooper, David, and Schwarting, Richard, 1981, Utah water use data, public-water supplies, 1979, Utah Department of Natural Resources, Utah Water Use Report 2, 80 p.

GROUND-WATER CONDITIONS IN UTAH

Number: UT 64-046-C

Cooperating Agency: Utah Division of Water Resources

Staff: J. S. Gates, Hydrologist, Project Chief (part time)
W. F. Holmes, Hydrologist, Editor (part time)
Other editors as assigned prior to fiscal year 1981 (part time)
L. R. Herbert, Hydrologic Technician (part time)
C. L. Appel, Hydrologist (part time)
Other District personnel as assigned

Period of Project: Began July 1963, continuing

Objective: To determine changing ground-water conditions in Utah, including status of development.

Approach: The State includes areas of major and minor ground-water development. Data and interpretation are most detailed and control most adequate for the areas of major development. Interpretations for the areas of minor development are based on relatively few data. Each year, ground-water withdrawals for irrigation are estimated using annual ratings of pumps as to power used to pump a given quantity of water, ratings of flowing wells, and calculations based on pump ratings and electrical-power records. Estimates of ground-water withdrawals for public supply are based largely on data obtained by the Utah Division of Water Rights. Estimates for industrial use are obtained from users or by rating pumps and using power records. Water-level changes are determined from annual measurements, most of which are made in March. Also, records are kept of the number and sizes of new wells drilled in the State as determined from well drillers' reports to the Utah Division of Water Rights. The conditions in specific areas of major development are described in the annual report by the most knowledgeable person in the District. The project chief assigns work, and the editor coordinates the report preparation and prepares the annual summary statement.

Progress: Visits were made to approximately 500 wells during 1981, more than half of which were measured for discharge. The nineteenth in a series of annual reports that describe ground-water conditions in Utah was completed. The estimated total withdrawal of water from wells in Utah in 1981 was 832,000 acre-feet or about 78,000 acre-feet more than was reported for 1980 and about 19,000 acre-feet more than the average reported for 1971-80. The increase from 1980 was due chiefly to increased withdrawals for irrigation. The total number of wells drilled during 1981 was about 39 percent less than for 1980.

Plans for Next Year: Accumulation of data on water levels, ground-water withdrawals, and numbers of new wells constructed will continue as during the previous year. The twentieth of this series of annual reports will be submitted in 1983.

Reports:

Holmes, W. F., and others, 1982, Ground-water conditions in Utah, spring of 1981: Utah Division of Water Resources Cooperative Investigations Report 22.

CANAL-LOSS STUDIES

Number: UT 74-107-C

Cooperating Agency: Utah Division of Water Rights

Staff: R. W. Cruff, Hydrologist, Project Chief (part time)
L. R. Herbert, Hydrologic Technician (part time)
Other District personnel as assigned

Period of Project: Began July 1973, continuing

Objectives: To determine the amount of water lost by seepage from canals in irrigated areas throughout the State. This information will contribute to current and future cooperative areal investigations as well as to resolution of the problem of water allocations to the users.

Approach: Gaging-station and measuring sites are selected, based on a reconnaissance of the canals. Seepage runs are made three to five times during an irrigation season. The seepage measurements are adjusted for fluctuations in stage of the canal during the course of each seepage run. Each set of canal studies spans a 2-year period.

Progress: The Utah and Salt Lake, Utah Lake Distributing, and Provo Reservoir Canals on the west side of Salt Lake (Jordan) Valley were selected and a reconnaissance was made of each canal. Gages were installed and measuring sites selected. Two sets of seepage measurements were made.

Plans for Next Year: Continue the seepage measurements on the Provo Reservoir, Utah Lake Distributing, and Utah and Salt Lake Canals. Move the gages to canals on the east side of Salt Lake (Jordan) Valley, and begin seepage measurements on these canals.

Reports:

Herbert, L. R., Cruff, R. W., and Holmes, W. F., 1982, Seepage study of the Sevier River and the Central Utah, McIntyre, and Leamington Canals, Juab and Millard Counties, Utah: Utah Department of Natural Resources Technical Publication 74, 43 p.

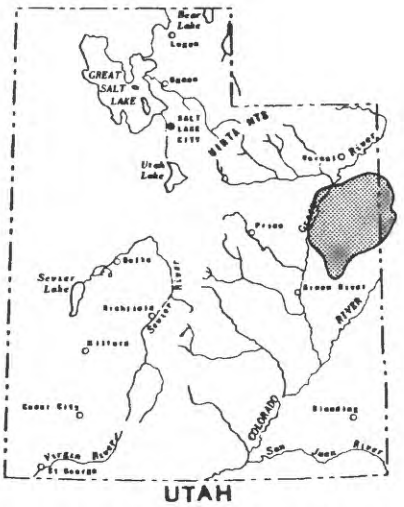
HYDROLOGY OF THE OIL-SHALE AREA, UINTA BASIN

Number: UT 75-113-F

Cooperating Agencies: (for related basic-data collection only)
U.S. Bureau of Land Management;
Utah Department of Natural Resources

Staff: R. W. Cruff, Hydrologist, Project Chief (part time)
G. C. Andersen, Hydrologist (part time)
D. M. Batty, Hydrologic Technician (part time)
Other District personnel as assigned

Period of Project: Began October 1974, continuing.



Objective: Monitor surface and ground water in the southeastern part of the Uinta Basin in order to obtain baseline hydrologic data prior to and during oil-shale development.

Approach: The study involves maintaining a data network and publishing the resulting data, and modifying the network where required to monitor baseline hydrologic conditions and hydrologic impacts of the developing oil-shale industry.

Progress: Monitoring continued at 7 streamflow sites and 1 well in alluvium. The streamflow monitoring included: flow--continuous; conductivity and temperature, common ions, nitrate plus nitrite and phosphate--quarterly; sediment--continuous at two sites and miscellaneous at others; and trace metals and biological sampling at selected sites. Water levels and water-quality information are obtained monthly for the well. The streamflow sites and the well are also included in sites listed under projects UT-001 and UT-002. For the 15 reports listed below, all of which resulted from the interpretive phase of the project (1974-79), 12 are published, 3 are in review.

Plans for Next Year: Continue monitoring at the 7 streamflow sites and the 1 well.

Reports:

Butler, J. R., and England, J. L., 1979, Vegetation map of the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Miscellaneous Investigations Map I-1141.

Conroy, L. S., 1979, Hydrologic and climatologic data, southeastern Uinta Basin, Utah and Colorado, water year 1977: U.S. Geological Survey Open-File Report 79-1493 (also duplicated as Utah Hydrologic-Data Report 33), 193 p.

Conroy, L. S., 1980, Hydrologic and climatologic data, southeastern Uinta Basin, Utah and Colorado, water year 1978: U.S. Geological Survey Open-File Report 80-1025 (also duplicated as Utah Hydrologic-Data Report 34), 166 p.

Conroy, L. S., and Fields, F. K., 1977, Climatologic and hydrologic data, southeastern Uinta Basin, Utah and Colorado, water years 1975 and 1976: Utah Basic-Data Release 29, 244 p.

Holmes, W. F., 1979, Maps showing generalized structure contours on the tops of the Wasatch and Green River Formations, geologic sections, and contours of thickness of the Green River Formation, southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Miscellaneous Investigations Map I-1156.

Holmes, W. F., 1980, Results of test drilling for ground water in the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Water-Resources Investigations 80-951, 90 p.

Holmes, W. F., and Kimball, B. A. (in review), Ground water in the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Water-Supply Paper.

Hudson, H. H., 1976, Hydrologic studies in the oil-shale areas of Colorado, Utah, and Wyoming: U.S. Geological Survey Open-File Report.

Jurado, Antonio, and Fields, F. K., 1978, Channel migration of the White River in the eastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Miscellaneous Investigations Map I-1087.

Kimball, B. A., 1981, Geochemistry of spring water, southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Water-Supply Paper 2074, 30 p.

Lindskov, K. L., and Kimball, B. A. (in review), Streamflow in the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Water-Supply Paper.

Lindskov, K. L., and Kimball, B. A. (in review), Water resources and hydrologic effects of oil-shale development in the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Professional Paper.

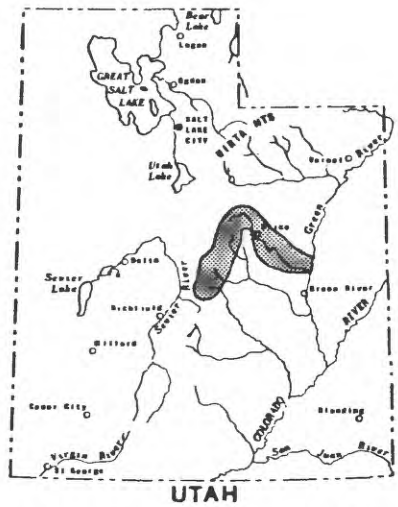
Naten, R. W., and Fuller, R. H., 1981, Selected biological characteristics of streams in the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Water-Resources Investigations 81-644, 38 p.

Seiler, R. L., and Tooley, J. E., 1982, Erosion and sediment characteristics of the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-428.

Waltemeyer, S. D., 1982, Selected climatic characteristics of the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-91, 33 p.

WATER-RESOURCES MONITORING - CENTRAL UTAH COAL REGION

Number: UT 77-129-F



Staff: R. W. Cruff, Hydrologist, Project Chief (part time)
Other District personnel as assigned

Period of Project: Began August 1978, continuing

Objective: To determine the characteristics of the regional surface-water system and to detect and document changes in quantity and quality that may be associated with coal mining.

Approach: Evaluate the existing basic-data collection program for its regional surveillance value and add additional data sites or upgrade existing sites as needed. Evaluate the data as they are collected so that changes due to coal mining may be detected and documented.

Progress: The operation of 7 gaging stations continued. Data on flow, water quality, and suspended sediment were collected during the 1981 water year. All data were prepared for inclusion in the Geological Survey report "Water Resources Data for Utah" for the 1981 water year.

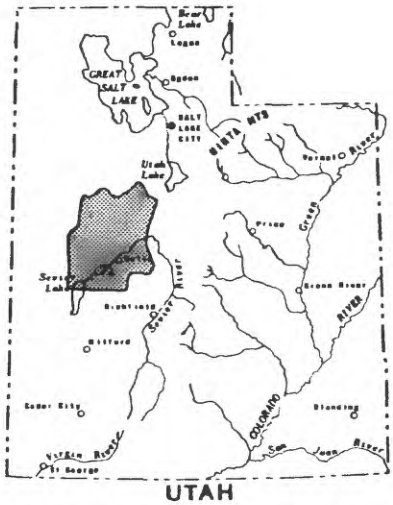
Plans for Next Year: The seven stations will continue to be operated in the Wasatch Plateau, Book Cliffs, and Emery coal fields.

Reports:

Lines, Gregory C., and Plantz, Gerald G., 1981, Hydrologic-monitoring in the coal fields of central Utah, August 1978-September 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-138.

GROUND-WATER CONDITIONS IN THE SEVIER DESERT, WITH PREDICTIONS OF THE EFFECTS OF FUTURE WITHDRAWALS USING A DIGITAL-COMPUTER MODEL

Number: UT 79-139-C



Cooperating Agency: Utah Division of Water Rights

Staff: W. F. Holmes, Hydrologist, Project Chief
M. Enright, Hydrologic Technician
D. E. Wilberg, Hydrologic Field Assistant (part time)
Other District personnel as assigned

Period of Project: July 1979 to June 1982

Objectives: On the basis of early study data obtained since 1962 and using recent analytical techniques, particularly digital-computer modeling, update information on and revise concepts of the ground-water system, particularly: (1) location, source, and amount of recharge and discharge; (2) rates and direction of the movement of ground water, past, present, and future; (3) amount of ground water of various qualities in storage and the amount recoverable under various pumping schemes; (4) effects of continued present or increased future pumping on ground-water levels; and (5) effects of proposed changes in points of diversion and locations of use of both surface and ground water on the hydrologic system.

Approach: All pertinent ground-water data in the files of Federal and State agencies and private organizations will be put in computer storage. The water-level measurement and pumpage-inventory programs will be increased greatly during the first year to improve definition of the potentiometric surfaces, to determine the accuracy of past pumpage measurements, and to improve the accuracy of future measurements. Aquifer tests will be made and old tests reanalyzed to determine hydraulic coefficients of the several parts of the ground-water reservoir. Geophysical logs will made of all available and suitable wells. A three-dimensional digital-computer model will be the principal tool used in testing and analyzing the hydrologic concepts concerning the ground-water reservoir, including the relationships of the individual aquifers upon each other, effects of various possible levels of future withdrawals, and effects of changes in location of diversion and use of surface and ground water.

Progress: Monthly measurements of water levels at selected observation wells and collection of monthly pumpage data from selected irrigation wells and flowing wells have been completed and discontinued. Computer storage of ground-water data is continuing. The digital-computer model has been designed and is currently being calibrated. Several aquifer tests have been completed and analyzed. An aquifer-test report has been completed and a basic-data report is in review.

Plans for Next Year: Complete calibration of digital-computer model and simulate future withdrawals. Prepare digital-model report and complete final interpretive report.

Reports:

Holmes, W. F., and Wilberg, D. E., 1982, Results of aquifer test near Lynndyl, Utah: U.S. Geological Survey Open-File Report 82-514, 17 p.

Enright, M., and Holmes, W. F. (in review), Ground-water data, Sevier Desert, Utah: U.S. Geological Survey Open-File Report (Hydrologic-Data Report)

Holmes, W. F. (in preparation), A digital-computer model of the ground-water reservoirs of the Sevier Desert, Utah: U.S. Geological Survey Open-File Report.

Holmes, W. F. (in preparation), Ground-water conditions in the Sevier Desert, Utah, 1963-81: Utah Department of Natural Resources Technical Publication.

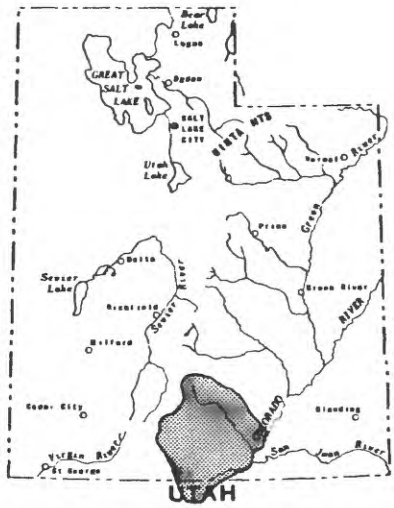
GROUND-WATER CONDITIONS IN THE KAIPAROWITS AREA, UTAH AND ARIZONA, WITH EMPHASIS ON THE NAVAJO SANDSTONE

Number: UT 79-140-C

Cooperating Agency: Utah Division of Water Rights

Staff: P. J. Blanchard, Hydrologist, Project Chief
Other District personnel as assigned

Period of Project: July 1979 to June 1982



Objectives: The study will provide quantitative data about aquifers: extent, thickness, porosity, hydraulic conductivity, transmissivity, storage coefficient, rates of discharge and recharge, directions of ground-water flow, chemical quality of water, and volumes of water of various qualities in storage. The study will be directed mainly at the Navajo Sandstone. It will include determination of actual and potential well yields and qualitative prediction of the effects of increased ground-water use associated with potential coal development and other uses of water. Some supplementary data on surface water will be included. The effects of Lake Powell on the Navajo Sandstone aquifer will be estimated.

Approach: General aquifer characteristics will be determined from available and collected geologic data. Hydraulic characteristics will be determined by aquifer tests, where possible. Additional information will be obtained from geophysical logs and analyses of lithologic samples. Areas of ground-water discharge and recharge will be determined by collation of available hydrologic data and from observations made during the study. Rates of ground-water recharge will be estimated from surface-water seepage measurements and rates of infiltration of precipitation in upland areas. Rates of ground-water discharge will be estimated from well- and spring-discharge data, seepage inflow to streams, and evapotranspiration estimates. Directions of ground-water flow will be determined from a potentiometric surface constructed using water-level data from wells and springs. Chemical analyses of water from selected ground-water sites and related surface-water sources will be used to obtain volumes of water of various qualities in storage. Standard analytical techniques will be used to predict the approximate effects of withdrawing water from the Navajo Sandstone on ground-water levels and stream discharge. Effects of Lake Powell on the Navajo aquifer will be determined from water-level records for wells and aquifer data obtained near the lake.

Progress: Fieldwork was completed on October 30. Observation wells were measured through October, an inventory of springs discharging from the Navajo was completed, and seepage runs were performed on reaches of the Escalante and Paria Rivers. A combined basic-data and interpretive report has been compiled and written.

Recharge to and discharge from the Navajo Sandstone in the Kaiparowits area is estimated to be only a few thousand acre-feet per year. This value is based on discharge via springs, wells, and evapotranspiration. There is evidence for both upward and downward leakage to overlying and underlying formations as well as ground-water movement out of the study area, but the amounts of water involved could not be quantified. Because of scanty data, the amount of water in storage in the Navajo Sandstone for the entire project area was not quantified.

Plans for Next Year: None.

Reports:

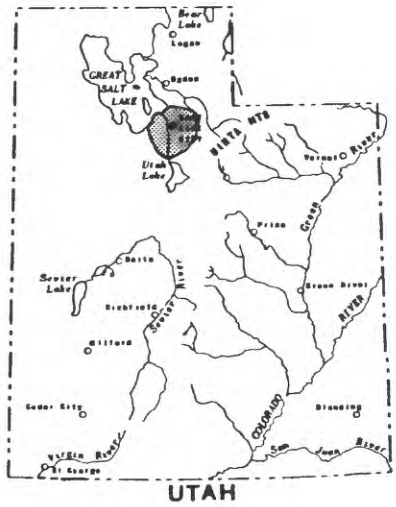
Blanchard, P. J. (in preparation), Ground-water conditions in the Kaiparowits area, Utah and Arizona, with emphasis on the Navajo Sandstone: Utah Department of Natural Resources Technical Publication.

SALT LAKE COUNTY URBAN RUNOFF

Number: UT 79-142-C

Cooperating Agency: Salt Lake County Division of Flood Control and Water Quality

Staff: R. C. Christensen, Hydrologist, Project Chief (part time)
D. W. Stephens, Hydrologist (part time)
G. E. Pyper, Supervisory Hydrologic Technician (part time)
H. F. McCormack, Hydrologist (part time)
K. R. Thompson, Hydrologist (part time)
J. F. Weigel, Hydrologic Technician (part time)
L. S. Conroy, Hydrologic Technician (part time)
L. Armstrong, Technician, Salt Lake County
S. Mitckes, Technician, Salt Lake County
B. Santisteven,Technician, Salt Lake County



Period of Project: September 1979 to August 1982

Objectives: To characterize urban runoff with respect to both quantity and quality and to demonstrate the effectiveness of various management alternatives in reducing pollution loads from urban runoff. Work elements within the study will include: (1) Identification of the impact of urban runoff on the east-side canal system and on the east-side major tributaries to the Jordan River; (2) evaluation, limited to available data, of the effects of modifications to detention and catchment basins on the quality of urban storm water; (3) evaluation, limited to available data, of the effects of wetland flow treatment on water quality; and (4) hydrologic analysis of urban-storm-runoff data collected from a basin for which the cooperator will evaluate the effectiveness of a program of public information/education on practices to improve the quality of urban runoff.

Approach: A system of sampling sites will be established in Salt Lake County to collect concurrent data on precipitation, wet and dry atmospheric fallout, and quantity and quality of urban runoff. These sampling sites (gaging stations) will be on the major Jordan River east-bank tributaries, the main canal systems east of the Jordan River, and at small best-management-practice (BMP) basins to characterize urban runoff and to demonstrate the effectiveness of various management alternatives to improve the quality of urban runoff. A consistent set of basin and storm characteristics and environmental practices will be inventoried for each selected basin for use in data analysis and for regional and national transferability. As data are collected, the reliable data will be placed in WATSTORE, statistical analyses will be made to relate storm water-quality constituent loads to basin and storm characteristics and environmental practices.

Progress: The urban data-monitoring system was operated and maintained throughout the year for the collection of atmospheric wet- and dry- deposition at 6 sites, precipitation at 23 sites, and urban runoff at 46 sites, except for the following changes. Atmospheric wet- and dry-deposition sites were reduced from six to four sites on October 1, 1981, and no data were collected from December 2, 1981, to March 28, 1982; precipitation sites were reduced from 23 to 20 sites on October 12, 1981; and urban runoff from rainfall was sampled for suspended sediment, inorganic and organic chemical constituents, and bacteriological indicators at 26 sites through September 30, 1981, and thereafter only at 8 sites located at small best-management-practice (BMP) basins. Urban storm runoff on October 29-30, 1981, was sampled for priority pollutants at three sites. The inventory of basin and storm characteristics was completed. Most of the data collected during the 1981 water year were processed and entered into WATSTORE. All processed data were analyzed to relate storm water-quality constituents to basin and storm characteristics. A draft of the final interpretive report was completed.

Plans for Next Year: Continue the current data-monitoring program to the end of the project. Complete the processing of data collected through September 30, 1981, and prepare a 1981 water year basic-data report.

Reports:

Pyper, G. E., Christensen, R. C., Stephens, D. W., McCormack, H. F., and Conroy, L. S., 1981, Selected surface-water and climatological data, Salt Lake County, Utah, water year 1980: U.S. Geological Survey Open-File Report 81-1111 (duplicated as Utah Hydrologic-Data Report 36), 167 p.

Christensen, R. C., Stephens, D. W., Pyper, G. E., and McCormack, H. F. (in preparation), Quality and quantity of runoff and atmospheric deposition in the urban area of Salt Lake County, Utah 1980-81: U.S. Geological Survey Water-Resources Investigations.

McCormack, H. F., Pyper, G. E., Christensen, R. C., Stephens, D. W., Weigel, J. F., and Conroy, L. S. (in preparation), Surface-water and climatological data, Salt Lake County, Utah, water year 1981, with selected data for 1980-82: U.S. Geological Survey Open-File Report (Hydrologic-data report).

GROUND-WATER CONDITIONS IN NORTHERN UTAH VALLEY, WITH PREDICTIONS OF THE EFFECTS OF FUTURE WITHDRAWALS USING A DIGITAL-COMPUTER MODEL

Number: UT 80-143-C

Cooperating Agency: Utah Division of Water Rights

Staff: D. W. Clark, Hydrologist, Project Chief
C. L. Appel, Hydrologist
P. E. Fairbanks, Hydrologic Technician (part time)

Period of Project: January 1980 to June 1983

Objectives: On the basis of data obtained since 1963 and using a three-dimensional digital-computer model, determine changes in ground-water levels and quality, and update and revise concepts of ground-water occurrence, particularly: (1) location and amount of recharge from seepage from streams and irrigation, subsurface flow from consolidated rocks, and precipitation; and location and amount of discharge from springs and wells, evapotranspiration, diffuse seepage into Utah Lake, seepage to drains, streams, and sewers, and subsurface outflow into Jordan Valley; (2) predict effects of continued present or increased future pumping on water levels in the four defined aquifers, and estimate effects on the chemical quality of ground water; and (3) estimate, if possible, the effects of potential importation of surface water by the Central Utah Project on the ground-water system.

Approach: All applicable historical data will be compiled and put in computer storage. A field inventory of large wells drilled since 1963 will be completed and an observation-well network will be established, including those wells used in the Statewide observation program, in order to improve definition of the potentiometric surfaces for all four aquifers. Quantification of discharge and recharge will be made from field measurements, pumpage records, and various methods of estimation. Water from selected wells, springs, and surface sources will be sampled for chemical analysis. Aquifer tests will be made to determine hydraulic coefficients and their possible vertical and horizontal variations. Geophysical logs will be made on all available and suitable wells. A water budget will be prepared. A three-dimensional digital-computer model will be designed and calibrated and will be the principal tool used in analyzing hydraulic properties of the ground-water reservoir, relationships of individual aquifers with each other, effects of changes in ground-water withdrawals on water levels, and as a means of qualitatively estimating changes in chemical quality of the water.

Progress: Water levels were measured in about 180 wells in March 1982. Since March 1981, water levels in about 50 of these have been measured bimonthly. Core drilling of two deep wells was completed and observation wells were installed. Core analysis for hydrologic and geologic properties continues. Ten shallow water-table wells were installed. Field measurements of ground-water discharge were completed. Twelve transects were run noting vegetation types and density, in order to estimate total evapotranspiration. Discharge measurements were made on 60 drains and springs at base flow and 15 were remeasured and sampled for water-quality analysis. Inventory and measurements of discharge from large pumping wells continued. Discharge was measured in 110 flowing wells in 4 representative sections and in 35 wells with historical discharge data. In addition, discharge was measured in 50 of these wells 3 times. Seepage studies were done on American Fork, Dry Creek, and Fort Canyon Creek and in some of their associated irrigation canals in order to make estimates of recharge to the ground-water reservoir. A total of about 75 wells were sampled for water-quality analysis. Aquifer tests were conducted including one large-scale pumping test and several flowing-well recovery tests. Geophysical logging was done on a few wells. Preliminary potentiometric-surface maps and water-level-change maps were completed. Submission of most data into the computer system has been completed. Work continues on calibration of the digital-computer model. The basic-data report is being prepared. Fieldwork was completed as of July 1, 1982.

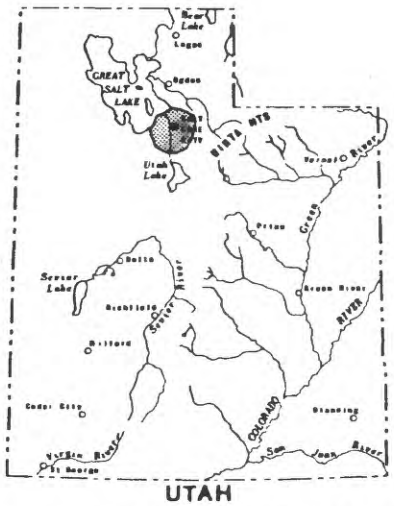
Plans for Next Year: Complete basic-data report, edit computer files and correct as many errors as possible. Continue data analysis. Complete digital-computer model calibration and transient simulation. Prepare final interpretive report and model report.

Reports:

Appel, Cynthia L., Clark, David W., and Fairbanks, Paul E. (in preparation), Selected hydrologic data for Northern Utah Valley, Utah, 1935-81: U.S. Geological Survey Open-File Report (Hydrologic-Data Report).

JORDAN RIVER QUALITY

Number: UT 80-144-C



Cooperating Agency: Salt Lake County Division of Flood Control and Water Quality

Staff: R. C. Christensen succeeded by D. W. Stephens, Hydrologist, Project Chief (part time)
K. R. Thompson, Hydrologist (part time)
J. F. Weigel, Hydrologic Technician (part time)

Period of Project: December 1979 to September 1983

Objectives: To provide Jordan River basin planners and managers with sound technical information and methods, based on definition of cause-effect relationships, to use in evaluating impacts of planning alternatives on the water quality of the Jordan River.

Approach: Determine, in conjunction with concerned city, county, State, and Federal agencies, water-quality problems of the Jordan River that should be evaluated during the study. Determine the river hydrologic characteristics. Select applicable evaluation methods to assess water-quality problems. Review available data and consider the data that will be provided by the Urban-Runoff Study, then plan necessary field and laboratory programs to collect additional data at the intensity appropriate to adequately assess the problems. Analyze the data and formulate the evaluation method to provide predictive capability for each problem. Forecast the impacts of planning alternatives on each problem.

Progress: Monthly sampling has been done at five sites from the Jordan Narrows to 500 North in Salt Lake County for the period December 1979 through June 1982. Sampling has been oriented to provide data on the four substudy topics: turbidity, toxic substances, dissolved oxygen, and sanitary quality. Nearby continuous discharge data are available for the same period. Two time-of-travel and oxygen-reaeration studies have been completed for the reaches 6400 South Street to 1700 South and 1700 South to 500 North. A reconnaissance sampling of water and sediment for three metals and selected pesticides was completed at five sites during August 1981.

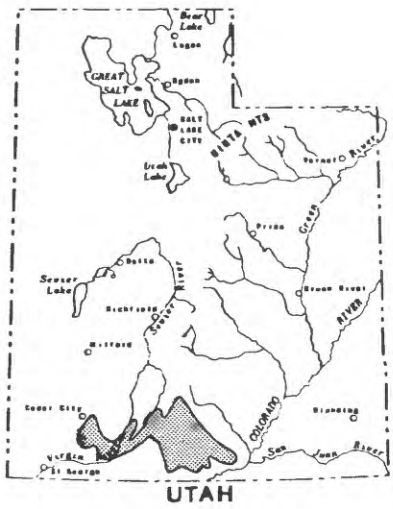
Plans for Next Year:

1. Continue field and laboratory data-collection programs to adequately assess river water-quality problems of toxic substances, dissolved-oxygen depletion, sanitary quality, and turbidity-suspended sediment.
2. Make preliminary graphical correlations of problem constituents with other constituents and river parameters such as river mile, depth, discharge, etc., to develop cause-effect relationships.
3. Make time-of-travel studies for the Jordan River under low-, moderate-, and high-flow conditions. Conduct simultaneous reaeration measurements to calculate an oxygen budget.
4. Conduct several oxygen diel studies, particularly on the river north of 2100 South Street.
5. Conduct a second reconnaissance of trace metals and pesticide levels in the water and sediments.
6. Summarize data in preparation for interpretive reports. Separate reports on each of the four substudies and a summary are planned.

Reports: None.

HYDROLOGY OF THE KAIPAROWITS, ALTON, AND KOLOB COAL FIELDS, SOUTHERN UTAH

Number: UT 81-146-I



Cooperating Agency: U.S. Bureau of Land Management

Staff: G. G. Plantz, Hydrologic Technician, Project Chief
J. I. Steiger, Hydrologic Technician
Other District personnel as assigned

Period of Project: October 1980 to September 1983

Objectives: The main objective of the study is to define the hydrologic system, namely the seasonal variations in surface-water quantity and quality and the extent, characteristics, and recharge-discharge relationships of aquifers above, within, and directly below coal-bearing rocks. The second objective is to predict qualitatively, where possible, the effects of coal mining on the water resources.

Approach: Standard techniques of hydrologic investigations will be used, including: a thorough literature and file search for existing data, flow measurements and sampling of surface water to define seasonal variations, an extensive well and spring inventory, inventory of present mining and water production in the area, observations of water-level fluctuations in wells, aquifer tests to determine aquifer coefficients, base-flow measurements on streams to determine gaining and losing reaches, and perhaps radioisotope or fluorocarbon dating of ground water.

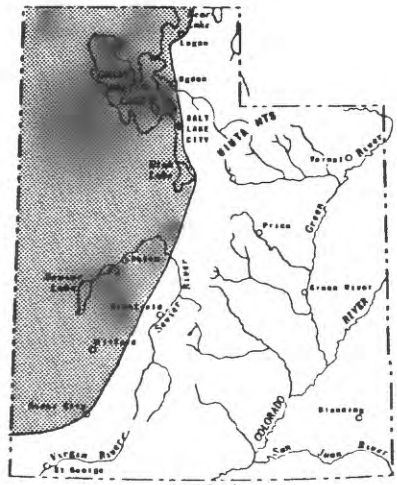
Progress: All the wells in the area have been inventoried and stored in GWSI computer files. Ninety-five percent of the springs have been inventoried. Fieldwork to obtain data on surface-water quantity and quality is 75 percent complete. Planning for the final reports was begun.

Plans for Next Year: Complete surface-water fieldwork, which includes base-flow measurements on selected streams to define gaining and losing reaches and the relationships between ground and surface water. Complete the spring inventory, and continue to measure springs and wells to qualitatively define storage properties of aquifers. Prepare a basic-data report by January 1983, and a Hydrologic Investigations Atlas by April 1983.

Reports: None.

GREAT BASIN REGIONAL AQUIFER SYSTEMS ANALYSIS

Number: UT 81-147-F



UTAH

Staff: J. R. Stark, Hydrologist, Project Chief
J. S. Gates, Hydrologist (part time)
J. L. Mason, Hydrologist
P. L. Buettner, Hydrologic Field Assistant (part time)
R. T. Green, Hydrologic Field Assistant (part time)

Period of Project: October 1980 to October 1984

Objectives: This study is one in a series of national studies of regional aquifer systems that together will cover much of the United States. The Great Basin study is headquartered in Carson City, Nevada, with part of the work located in the Utah District office. The overall objective is to assemble hydrologic information and create predictive capabilities necessary for effective management. The Great Basin is made up of individual basins that have alluvial-fill aquifers of similar origin, but these aquifers are either not connected hydrologically or have limited connection, sometimes by way of consolidated-rock aquifers underlying the uplands that separate basins. Specific objectives are to establish common principles governing occurrence, recharge, movement, discharge, and quality of water in the aquifers of the Great Basin, and to construct digital-computer ground-water models of representative basins or groups of hydrologically connected basins. The models will be used to help understand the natural (pre-development) flow and geochemical systems and to predict effects of future development and differences in the effects of various management strategies.

Approach: Computer simulation will be the main tool used to analyze the existing hydrogeologic regime and to provide the capabilities of predicting the effects of future development. The simulations will incorporate hydraulic effects, and where necessary and feasible, such associated effects as solute transport and land subsidence. Simulation will be initiated early in the study to help determine the overall nature of the flow system, to identify sensitive parameters and data needs, and to determine what segments of the system, if any, can be treated independently. Assembling available hydrogeologic data on the Great Basin is an important part of the work, and collection of new data needed for successful simulation may require fieldwork. The present distribution of water quality throughout the area will be described using available and project-collected data. These data will be used to interpret the water-quality distribution in terms of the original flow pattern and geochemical processes, and an effort will be made to predict water-quality changes in response to future development, waste disposal, or artificial recharge.

Progress: Maps and tables have been compiled for the Utah part of the Great Basin, using available data and data obtained from Air Force contractors making MX-Missile siting studies, showing water levels, depth to water, major springs, ground-water discharge, hydrologic-data sites for and preliminary definition of consolidated-rock aquifers, and flow-system definition. Plans were prepared for making monthly measurements of discharge of major springs and some instrumentation was installed. Major springs have been sampled for isotope analyses. Water levels were measured in March in the Milford area and a potentiometric-surface map prepared. A pumpage inventory of the Milford area during the 1981-82 irrigation seasons was begun. Specifications for a series of geophysical surveys to be made in Tule Valley have been prepared. These surveys will obtain data which will be used to interpret thickness and lithology of basin fill and to estimate hydrologic parameters for a digital-computer model. A gravity survey was made in Tule Valley. A project-planning document has been prepared in conjunction with the Nevada District. A field inventory of all wells drilled during MX-Missile siting studies has been completed. Design and construction of digital-computer models of the Fish Springs flow system, Tule Valley, and the Milford area has begun.

Plans for Next Year: Complete all data-collection activities. Conduct geophysical surveys (earth resistivity and seismic) in Tule Valley. Continue calibration process of digital-computer ground-water models of Fish Springs flow system, Tule Valley, and Milford area. Drill shallow observation wells on the southeast side of Sevier Lake to see if ground water moves from the lake area to Wah Wah Valley or Tule Valley.

Reports:

Harrill, James R., and others, 1982, Aquifer Systems in the Great Basin Region of Nevada, Utah, and Adjacent States--A Study Plan: U.S. Geological Survey Open-File Report 82-445.

FLOOD-PLAIN MAPPING IN BLM-ADMINISTERED LANDS IN UTAH, WITH EMPHASIS ON COAL-LEASE AREAS

Number: UT 81-148-I

Cooperating Agency: U.S. Bureau of Land Management

Staff: K. L. Lindskov, Hydrologist, Project Chief (part time)
B. E. Thomas, Hydrologist
E. J. Whitney, Hydrologic Field Assistant (part time)
W. Dorman-Ligh, Hydrologic Field Assistant (part time)
W. H. Kreusi, Hydrologic Field Assistant (part time)
S. Cullinan, Hydrologic Field Assistant (part time)

Period of Project: October 1980 to September 1982.

Objectives: Provide methods for delineating flood plains that the Bureau of Land Management can use to formulate land-use plans and enforce Public Law 95-87, the Surface Mining Act. Describe the hydraulic and hydrologic factors that must be considered when preparing flood-plain maps. Complete a manual outlining procedures for flood-plain mapping, including preparation of profiles of historic floods and profiles of theoretical floods, and discussion of Federal Insurance Administration Studies and "quick and dirty" techniques.

Approach: (1) Review existing techniques for outlining areas inundated by floods of selected return periods. (2) Update regional flood-frequency relations in order to more accurately predict peak flows for selected return periods. (3) Develop regional relations between flood depth for selected return periods, basin characteristics, and channel geometry. (4) Prepare a manual outlining standardized procedures for delineating flood plains.

Progress: Work for items 1-2 as outlined above is complete and that for items 3-4 will be completed by September 1982.

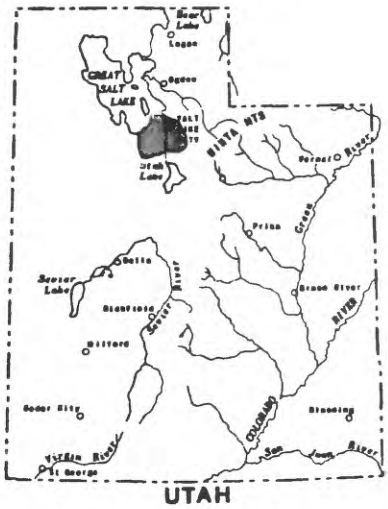
Plans for Next Year: Complete all interpretive work and finish draft of report by September 1, 1982. Conduct a workshop for BLM personnel on methods developed during the project.

Reports:

Thomas, B. E., and Lindskov, K. L. (in preparation), Methods for estimating peak discharge and flood boundaries of streams in Utah: U.S. Geological Survey Water-Supply Paper.

GROUND-WATER CONDITIONS IN SALT LAKE (JORDAN) VALLEY, WITH ANALYSIS BY FLOW AND SOLUTE-TRANSPORT MODELS

Number: UT 81-150-C



Cooperating Agencies: Utah Division of Water Rights; local water-management agencies and municipalities

Staff: K. M. Waddell, Hydrologist, Project Chief
R. L. Seiler, Hydrologist
S. M. Theobald, Hydrologic Field Assistant (part time)
Other District personnel as assigned

Period of Project: July 1981 to June 1985

Objectives: (1) To determine the current state of the Jordan Valley's ground-water system in terms of water levels, recharge, movement, discharge, water quality, and volumes of water of various qualities in storage; (2) to construct digital-computer models of the system that will be able to simulate ground-water flow and transport of dissolved solids; and (3) to determine, at least in a preliminary sense, the potential for land subsidence related to water-level declines.

Approach: (1) Update files of data on water levels, withdrawals and natural discharge, and water quality; (2) supplement available information with additional data collected on water levels and quality, recharge and discharge, aquifer and confining-bed parameters, and water in storage; (3) construct a three-dimensional digital model of the system to simulate ground-water flow and several cross-section solute-transport models to simulate movement of dissolved solids. Use the models to simulate changes in water levels and chemical quality resulting from potential ground-water development; and (4) publish results as a Utah Department of Natural Resources Technical Publication.

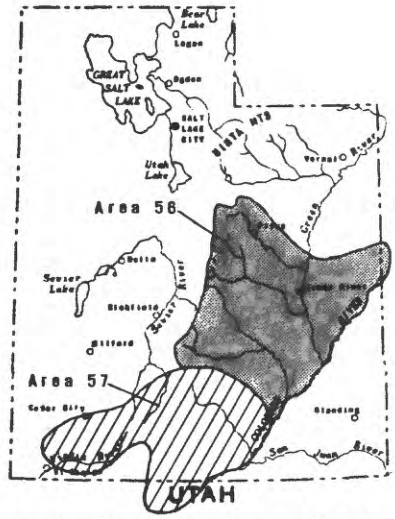
Progress: Prepared a planning document and preliminary report for the study. Began updating data files--tabulated wells drilled since 1968-69 and inventoried selected wells in the field. Tabulated chemical analyses of ground water made since 1968, and designed a sampling program to obtain data for evaluating the current state of the system and for future solute-transport modeling. Evaluated the observation-well network and modified as necessary. Planned comprehensive aquifer tests to determine vertical hydraulic conductivities. Planned shallow observation-well drilling to define the water table.

Plans for Next Year: Check compilations of pumpage data prepared since 1968 and obtain additional data if needed. Compile data on aquifer tests made since 1969. Collect existing data on the valley's shallow water table and conduct an augering and shallow observation-well construction program to better define the water table. Complete initial construction of a three-dimensional digital-computer model of ground-water system.

Reports: None.

HYDROLOGY OF AREAS 56 AND 57, ROCKY MOUNTAIN COAL PROVINCE, UTAH, COLORADO, AND ARIZONA

Number: UT 81-151-F



Staff: G. C. Lines, Hydrologist, Project Chief (part time)
Other District personnel as assigned

Period of Project: February 1981 to September 1984

Objectives: To describe the hydrology of Area 56 (the Wasatch Plateau, Book Cliffs, Emery, and Henry Mountains coal fields) and Area 57 (the Kaiparowits Plateau, Alton, and Kolob coal fields) in clear and concise reports that can be used by both the coal-mining industry and regulatory government agencies.

Approach: (1) A topic outline will be prepared for each report area. Topics will be assigned to District hydrologists for data analysis and writing based on discipline specialties. (2) For each topic, all available hydrologic information will be assembled, summarized, and interpreted as needed; no new data will be collected. (3) Each topic will be discussed in a text not to exceed one page, accompanied by maps, graphs, and tables as needed (STOP format). The report for Area 56 will be submitted for approval by September 30, 1982; the report for Area 57 will be submitted by September 30, 1983.

Progress: Report for Area 56 has been prepared and is in review.

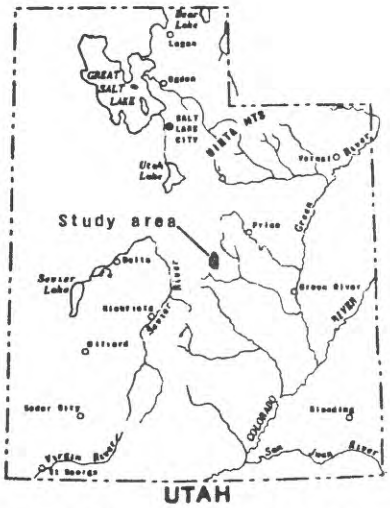
Plans for Next Year: Publish report for Area 56 and prepare report for Area 57.

Reports:

Lines, G. C., and others (in review), Hydrology of Area 56, Northern Great Plains and Rocky Mountain Coal Provinces, Utah and Colorado: U.S. Geological Survey Water-Resources Investigations.

GROUND-WATER CONDITIONS IN THE TRAIL MOUNTAIN COAL-RESOURCE AREA, CENTRAL UTAH

Number: UT 81-152-I



Cooperating Agency: U.S. Bureau of Land Management

Staff: G. C. Lines, Hydrologist, Project Chief (part time)
Other District personnel as assigned

Period of Project: March 1981 to September 1983

Objectives: (1) Determine aquifer characteristics, recharge-discharge relationships, hydraulic connection between aquifers and with streams, and chemical quality of water in water-bearing zones within, above, and immediately below coal in the Blackhawk Formation. (2) Predict, quantitatively where possible, the effects of underground coal mining on the ground-water system, including ground-water discharge to streams.

Approach: (1) Five coal-exploration holes will be completed as test wells; most wells will tap multiple water-bearing zones and will be tested with expandable packers in order to define differences in aquifer characteristics, water quality, and head with depth in the ground-water system. (2) An extensive spring inventory will be made. (3) Base flow along streams will be measured. (4) Hydraulic conductivity and porosity of representative core samples from aquifers and confining beds will be determined in the laboratory. (5) Surface and ground water will be sampled for chemical analysis. (6) A digital-computer model of the ground-water system will be constructed and calibrated and used to make semiquantitative predictions of effects of underground mining on the system.

Progress: Data and literature search is complete. Specifications have been prepared to complete five test wells in holes to be drilled by the Minerals Management Service during the summer of 1982. One test well was completed during the summer of 1981. Specifications for well testing have been prepared.

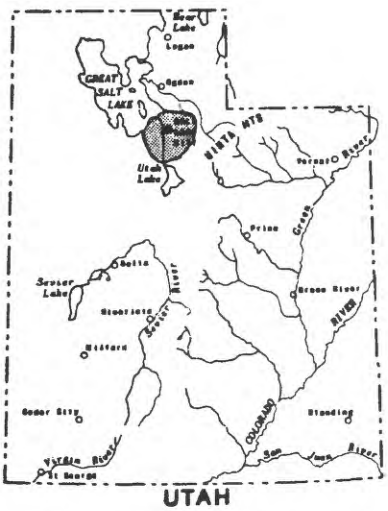
Spring inventory is complete, and seven springs have been monitored periodically to define discharge recession. One set of base-flow measurements has been made on streams. Twenty-one ground-water samples have been collected for chemical analyses. Quantity of discharge from the underground Trail Mountain Mine is being monitored.

Plans for Next Year: Complete water-level measurements, sampling, and aquifer testing on wells. Conduct second set of base-flow measurements on streams and continue monitoring mine discharge. Determine hydraulic conductivity of core samples. Analyze test data and calibrate digital-computer model. Prepare final interpretive report.

Reports: None.

ATMOSPHERIC INPUT TO QUALITY OF URBAN RUNOFF IN SALT LAKE COUNTY

Number: UT 81-153-F



Staff: D. W. Stephens, Hydrologist,
Project Chief (part time)
Other District personnel as assigned

Period of Project: May 1981 to September 1982

Objectives: To identify the major constituents in wet-fall and dry-fall in Salt Lake County, estimate the loading potential of these constituents to water in storm drains and streams, and determine correlation between quality of atmospheric deposition and runoff.

Approach: Determine the quality and quantity of atmospheric deposition through a network of precipitation gages and atmospheric-deposition collectors. Combine these data with data from storm-water sampling conducted under the Urban-Runoff Study (UT-142) and analyze the results for correlations and trends.

Progress: (1) Precipitation gages have been established and data collected at 22 sites in Salt Lake County. (2) Six atmospheric collectors for wet- and dry-fall have been established. (3) A total of 50 1-month composite dry-fall samples have been analyzed for total nutrients, selected total metals, and certain anions and cations. (4) A total of 52 storm wet-fall samples have been analyzed for nutrients, metals, and certain anions and cations. The arithmetic mean pH for the wet-fall samples was 5.9. Dissolved trace metals common in urban runoff (iron, copper, lead, and zinc) generally were present in concentrations greater than 10 micrograms per liter.

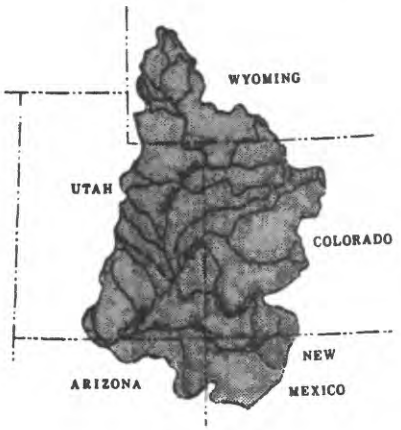
Plans for Next Year: (1) Complete data collection and analysis. (2) A chapter is being written which will be included in the interpretive report on the Salt Lake County urban-runoff study (UT-142).

Reports: None.

REGIONAL AQUIFER SYSTEMS ANALYSIS-MESOZOIC SANDSTONE AQUIFERS IN THE UPPER COLORADO RIVER BASIN

Number: UT 81-154-F

Staff: J. W. Hood, Hydrologist, Project Chief
Vacancy, Hydrologist
E. J. Weiss, Hydrologist
(Colorado District, part time)
B. A. Kimball, Hydrologist
(Colorado District, part time)
Vacancy, Hydrologist
Vacancy, Hydrologic Technician
D. E. Wilberg, Hydrologic Field Assistant (part time)



Period of Project: October 1981 to September 1985

Objectives: This study is one of the series of national studies of regional aquifer systems that together will cover much of the United States. In the Upper Colorado River Basin, aquifers that are truly regional include the complex of thick sandstones of Jurassic and Triassic age and carbonate and sandstone aquifers of Mississippian and Permian age. This study will target the thick sandstones of the Mesozoic System and locally related aquifers of lesser extent. The study is intended to (1) provide a basin-wide data base; (2) define and quantify recharge, occurrence, movement, discharge, and quality of ground water; (3) model the system(s) in order (a) to understand the natural (pre-development) flow and geochemical system(s) and (b) to evaluate or predict the effects of future development and differences in these effects due to various management strategies.

Approach: Computer simulation will be the main tool used to analyze the hydrogeologic regimen of the Mesozoic aquifers system. The results of prior local, areal, and regional studies will be collected and combined, and basic data from those studies will be updated. Concurrently, a preliminary regional flow model(s) will be constructed in order to test provisional hypotheses and show areas where additional data are needed. Following will be a period of data collection, during which the model(s) will be updated as field data are obtained. Final analyses will incorporate consideration of the effects of development on the ground-water flow regimen and storage, on surface-water flow, and on possible water-quality changes that would accompany development. Results of the study will appear as a planning document, data report(s), model documentation, and a final interpretive report.

Progress: All the work contemplated for the period July 1, 1981, to June 30, 1982, was not done, largely because of budgetary and personnel constraints. The entire data base for ground water in the region was scanned, principal deficiencies noted, and existing-data assembly started. Most existing data for seven Utah counties have been entered in computer files and about one-half the data for seven other Utah counties have been corrected or entered in the files. Existing data for ground-water quality were examined for trends, and design of a sampling network was begun. Base maps were ordered. The basic design for preliminary modeling of one part of the region was started. A District planning document was in preparation. A draft of the composite regional planning report (for Utah, Colorado, and Wyoming, jointly) was in review. A literature search on the region's hydrology was mostly completed.

Plans for Next Year: Assembly of existing data and data filing will be completed. Preliminary modeling of two to five subregional areas will be done as a guide to the planning of the principal ground-water system model(s). Supplementary geohydrologic data from petroleum test wells will be obtained for areas where other sources of model data are not available. Fieldwork, principally for water-quality studies, will be started. In addition, several sandstone aquifer samples will be collected for laboratory analyses of hydraulic parameters and lithology. All planning documents will be completed and updated as needed.

Reports:

Taylor, O. James, Hood, J. W., and Zimmerman, Everett A. (in preparation), Plan of study for the regional aquifer system analysis of the Upper Colorado River Basin in Colorado, Utah, and Wyoming: U.S. Geological Survey Water-Resources Investigations Open-File Report.

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATER OF THE VIRGIN RIVER BASIN

Number: UT 81-155-C

Cooperating Agency: Utah Division of Water Rights

Staff: K. R. Thompson, Hydrologist,
Project Chief (part time)
G. W. Sandberg, Hydrologist (part time)
Other District personnel as assigned

Period of Project: July 1981 to June 1983

Objectives: The basic objective is to define the general chemical characteristics of surface water in the 5,090-square-mile Virgin River basin terminating at Littlefield, Arizona. A secondary objective is to define specific problem areas or stream reaches for future intensive investigation.

Approach: Available data will be inventoried and compiled. These data, along with information on geology, irrigation, soils, vegetation, mineral development, and runoff will be used as the basis for design of a network of about 100 water-quality observation sites. From these 100 sites about 35 will be designated as major sampling sites and sampled more frequently. Data on the general chemistry of surface water will be obtained seasonally during the period July 1981 to September 1982. Trace-element, pesticide, and bacteriologic data will be collected at selected sites.

Progress: (1) Samples were collected on the Virgin River and its tributaries in August 1981, and in February and May 1982. (2) Specific conductance and temperature monitors have been installed on the Virgin River at Littlefield, Arizona, and the Virgin River below LaVerkin Hot Springs. (3) A dissolved-oxygen monitor has been installed intermittently at eight sites on the Virgin River.

Plans for Next Year: Complete sample collection and all interpretive work, and finish final draft of report by December 1, 1982.

Reports: None.

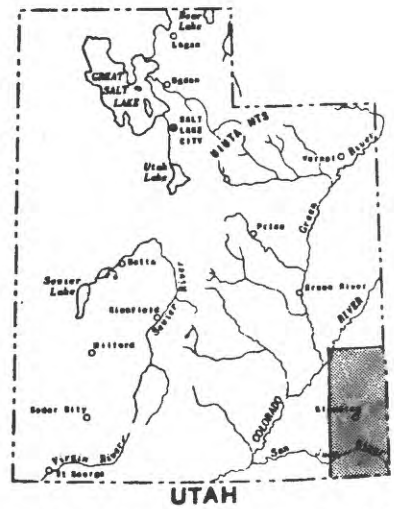
WATER IN BEDROCK IN EASTERN SAN JUAN COUNTY, WITH SPECIAL EMPHASIS ON THE NAVAJO SANDSTONE AND RELATED AQUIFERS

Number: UT 81-156-C

Cooperating Agency: Utah Division of Water Rights

Staff: C. F. Avery, Hydrologist, Project Chief
Other District personnel as assigned

Period of Project: July 1981 to June 1984



Objectives: To determine: (1) occurrence of ground water and its quality in the area, (2) potential yields of water from wells in the major aquifers, (3) whether those yields can be sustained for the production of fresh or otherwise usable water, and (4) what effect sustained, large, well withdrawals will have on water levels and water in the Colorado River.

Approach: Define the general hydrologic system using methods of general areal studies, and locate all available ground-water data and utilize results of all previous studies. Integrate field operations with the Upper Colorado River Basin RASA (UT-154) where possible. Concentrate field-data collection on determining recharge and discharge rates, aquifer coefficients, the potentiometric surface, and ground-water quality. Preliminary digital-computer modeling of the aquifer will be used to guide data acquisition and refined modeling will help assess effects of withdrawals.

Progress: A detailed project planning document was prepared. A coarse-grid model was prepared for the Entrada-Wingate Sandstone sequence. Runs were made to test the effects of varying interformational leakage and aquifer anisotropy on the water levels. The available well data have been compiled and entered into the computer-data system. Well inventory was begun in the field. Water levels, well discharge, and field water quality were measured, when possible. Eight water samples have been collected for common ion determination.

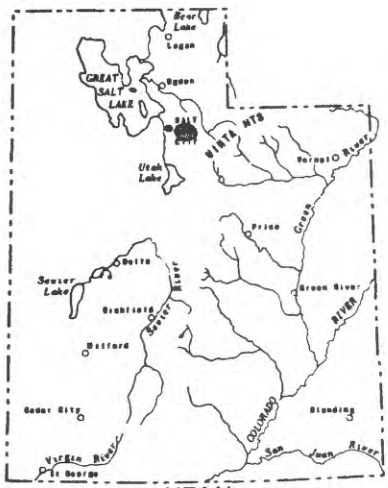
Plans for Next Year: Fieldwork will continue with well and spring inventory. Water samples will be collected for common ion and trace-metal determinations. Seepage runs will be made on streams, where possible. Aquifer tests will be conducted if suitable wells are found. Abandoned oil tests will be converted to observation wells, when possible, in areas of sparse data.

Reports: None.

PROPOSED PROJECTS

HYDROLOGY OF THE PARK CITY AREA

Cooperating Agency: Utah Division of Water Rights



Staff: W. F. Holmes, Hydrologist, Project Chief
M. Enright, Hydrologic Technician
Other District personnel as assigned

Period of Project: July 1982 to July 1985

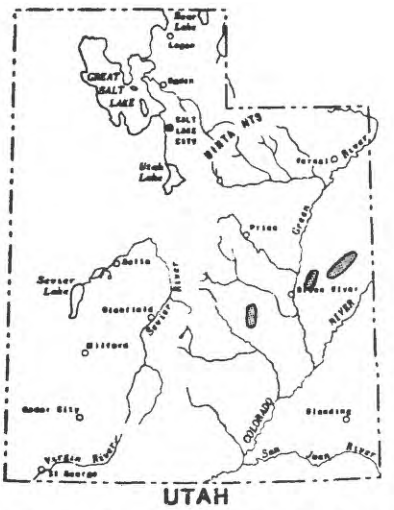
Objectives: Define the surface-water and ground-water hydrology and the relationship between them. Characterize consolidated and unconsolidated rock aquifers. Determine the effects of ground-water withdrawals from both aquifers including mine dewatering, surface-water diversions, and construction of a large reservoir on the system. Determine ground-water quality and the effects of continued development on water quality.

Approach: Define surface-water hydrology using existing records, additonal monitoring sites, and two new gages, to estimate average surface-water inflow and outflow in the study area and their quality. Estimate evapotranspiration by mapping phreatophytes, water surfaces, and wetland. Inventory all wells, drain tunnels, mines, and springs. Conduct seepage runs along major canals and streams to determine recharge or discharge. Determine direction of ground-water movement by measuring water levels in existing wells. Determine geologic characteristics such as strike, dip, fracturing or jointing, that may control ground-water occurrence and its flow direction. Determine hydraulic characteristics of aquifers by testing. Collect samples from wells and springs, surface water, and mines for chemical analysis; and determine water quality for all parts of the system. Characterize ground-water quality in both aquifers, and use data to infer source and movement of ground water. If feasible, construct a ground-water model to test the conceptualized ground-water system. If funds are available, drill test holes in both unconsolidated and consolidated rocks.

Plans for Next Year: Inventory wells and springs, construct and begin operation of gaging stations and partial-record sites, collect water-quality samples and measure water levels in existing wells.

HYDROLOGY OF THREE TAR SANDS AREAS IN EASTERN UTAH

Cooperating Agency: U.S. Bureau of Land Management



Staff: K. L. Lindskov, Hydrologist, Project Chief
Vacancies, Hydrologists (2)
Other District personnel as assigned

Period of Project: July 1982 to September 1985

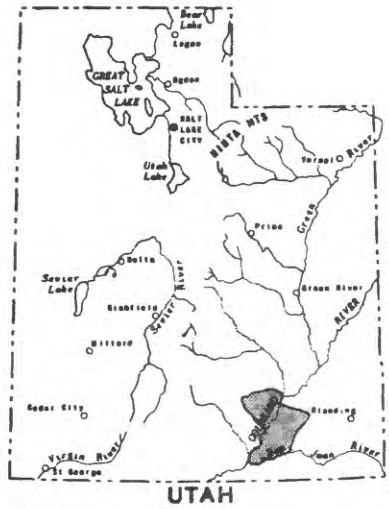
Objectives: Define the existing hydrologic system in the San Rafael Swell, P. R. Spring, and Hill Creek Designated Tar Sands Areas, and define the ground-water system in the P. R. Spring area in detail. Where possible, predict hydrologic impacts of tar sands production.

Approach: Define the hydrologic system by utilizing available hydrologic information, mainly from oil-shale studies and all other previous studies in and near the three areas. During the summer of 1983, update existing well and spring inventories and collect additional samples, where needed, to further refine definition of the chemical quality of surface and ground water. Prepare an interim report for submission to BLM by December 1, 1983, which describes the hydrology, primarily using existing data and interpretations available from previous studies. During the summer of 1984, conduct a well-drilling and testing program in the P. R. Spring area in order to define the ground-water system, namely the extent and hydraulic connection between aquifers, aquifer characteristics, and head and water-quality differences with depth. Prepare a final basic-data report and interpretive report which meet the stated objectives by September 1985.

Plans for Next Year: Define the hydrologic system using information from previous studies, update well and spring inventories, and where necessary collect samples to further refine chemical quality of surface and ground water. Complete planning document and part of interim report.

BEDROCK AQUIFERS IN THE NORTHERN LAKE POWELL AREA, UTAH, WITH EMPHASIS ON THE NAVAJO SANDSTONE

Cooperating Agency: Utah Division of Water Rights



Staff: P. J. Blanchard, Hydrologist, Project Chief
Other District personnel as assigned

Period of Project: July 1, 1982, to June 30, 1984, or June 30, 1985

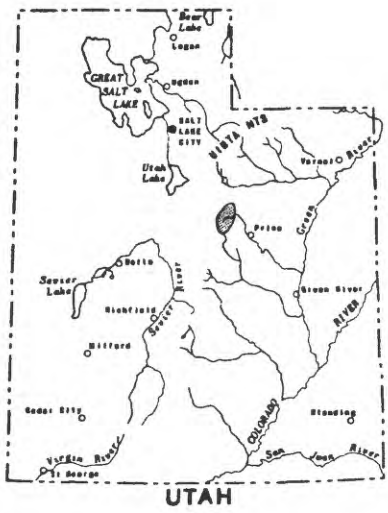
Objectives: Determine quantitatively the occurrence, recharge, quantity, movement, discharge, and quality of water in bedrock aquifers, with emphasis on the Navajo Sandstone. Additionally, determine hydraulic characteristics of the Navajo Sandstone and other significant aquifers and the relationships between surface water and ground water.

Approach: Existing data from the files of the U.S. Geological Survey, Utah Division of Water Rights, other government agencies, and private sources (including petroleum companies) will be integrated with data collected in the field. Field-data collection will include well and spring inventories, borehole geophysical logging, seepage studies on selected stream reaches, shallow-core sampling and laboratory analyses of cores for hydraulic properties, and both ground- and surface-water samples for chemical analysis. Abandoned oil-tests will be converted to observation wells, if feasible. Short-term aquifer tests will be performed where possible. The assembled data will be used to determine the hydrologic budget, potentiometric surface, and structural surface of the Navajo Sandstone; and the occurrence, amount, movement, and quality of water in the Navajo. If feasible, a simplified digital-computer model of the ground-water system will be prepared, and an attempt will be made to determine the relations between Lake Powell and the ground-water system.

Plans for Next Year: Prepare detailed planning document. Collect and compile existing data. Begin collection of field data.

SEDIMENT AND TRACE-METALS TRANSPORT IN STREAMS IN THE PLEASANT VALLEY COAL-RESOURCE AREA, CENTRAL UTAH, AND THEIR EFFECTS ON SCOFIELD RESERVOIR

Cooperating Agency: U.S. Bureau of Land Management



Staff: D. W. Stephens, Hydrologist,
Project Chief (part time)
J. F. Weigel, Hydrologist (part time)
Other District personnel as assigned

Period of Project: October 1982 to September 1985

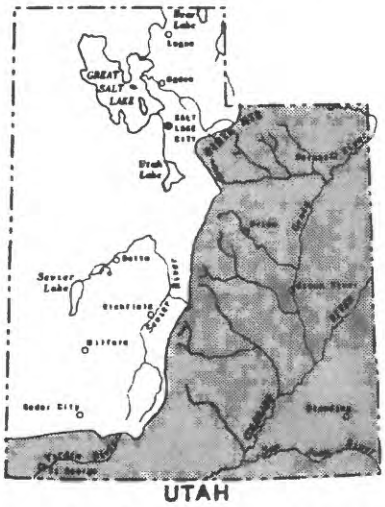
Objectives: Determine sediment and common trace-metal loads in selected streams in the Pleasant Valley coal-resource area. Determine loads entering Scofield Reservoir and their effects on reservoir geochemistry. Also determine if coal-mining and coal-washing operations have increased loads.

Approach: Monitor and compute sediment loads at existing gaging stations on (1) Pleasant Valley Creek near its point of inflow to Scofield Reservoir and (2) in Eccles Canyon (a tributary to Pleasant Valley Creek) downstream from an extensive area clearcut for mining and associated roads and downstream from a coal-washing plant. Also construct and maintain a gaging station and sediment-monitoring site on one other tributary to Pleasant Valley Creek that is unaffected by mining; or on Fish Creek, which has experienced no mining, and is the major inflow source for Scofield Reservoir. Analyze for the types and weights of metal oxides attached to selected sediment samples in order to compute trace-metal loads. If funds are available, collect a set of reservoir-sediment core samples and analyze for trace-metal content; and collect soil samples in undisturbed areas and areas disturbed by mining and analyze for available ions. Analytical work will performed in the U.S. Geological Survey Central Laboratory. Predict effects of present and future sediment and trace-metal transport into Scofield Reservoir on reservoir geochemistry. Prepare interpretive report by October 1985.

Plans for Next Year: Construct gaging station on a Pleasant Valley Creek tributary and begin data collection at all three gaging stations. Conduct a literature and data-base review, prepare a planning document, and plan potential reservoir-sediment and soil sampling.

SUMMARY OF AND REGIONALIZATION OF STREAMFLOW CHARACTERISTICS FOR THE COLORADO RIVER BASIN, UTAH, WITH EMPHASIS ON SYNFUEL-LEASE AREAS

Cooperating Agency: U.S. Bureau of Land Management



Staff: R. C. Christensen, Hydrologist, Project Chief
Vacancy, Hydrologic Technician or Hydrologist

Period of Project: October 1982 to September 1984

Objectives: (1) Compute and summarize streamflow characteristics for gaging stations in the Colorado River Basin, Utah. Using standard techniques, compute frequency curves for peak flow, 1-, 3-, 7-, and 15-day flood flow, and 1-, 7-, 14-, 30-, 60-, and 90-day low flow. (2) Provide methods for transferring streamflow characteristics from gaged to ungaged sites.

Approach: (1) Using Geological Survey computer programs, data in the WATSTORE files will be processed and statistics tabulated for all stations in the Colorado River Basin, Utah. The statistics will include listings of high- and low-flow summaries, flow duration, flow variability of monthly and annual values for active and discontinued stations with 1 or more complete years of daily flow, and annual peaks for all stations including the crest-stage partial records. Frequency curves will be computed for stations with 10 or more years of record and the high- and low-flow values will be tabulated depending on record length for recurrence intervals of 2, 5, 10, 25, 50, and 100 years. The information will be published in an interim report with a short manuscript for each station followed by the statistics. A brief text will define terms and give examples of how to use the data. (2) The second phase will be the regionalization of selected flow characteristics. The equations will be developed by relating flow to basin characteristics using multiple-regression techniques. Accuracy of these relations for transferring flow characteristics from gaged to ungaged sites will be compared to equivalent years of record at gaging stations. Derived relatives will be matched and adjusted to available results from adjacent states. A final report will outline procedures for using the relations to determine flow characteristics at ungaged sites.

Plans for Next Year: Item 1 as outlined above for Approach will be completed.